

What is claimed is:

1           1. An apparatus for manufacturing a semiconductor device using  
2           plasma, comprising:

3           a chamber having a plasma generating region and a plasma  
4           processing region for performing a manufacturing process on the  
5           semiconductor device under a plasma atmosphere;

6           a plasma generating means adjacent the plasma generating region;  
7           and

8           a plasma concentrating means for reducing the size of the plasma  
9           processing region near the semiconductor device to be processed compared  
10           to the size of a plasma generating region.

1           2. The apparatus as claimed in claim 1, wherein the plasma  
2           concentrating means comprises:

3           an electrode having a first length on which the semiconductor device  
4           to be processed is positioned;

5           an insulating plate having a second length longer than the first length  
6           and facing the electrode; and

7           a confinement layer contacting the edge of the insulating plate,  
8           forming an acute angle to a virtual plane connecting opposing ends of the  
9           insulating plate, and extending toward an edge of the first electrode.

1           3.     The apparatus as claimed in claim 2, wherein the insulating  
2     plate includes a first part having a first radius of curvature and a second part  
3     having a second radius of curvature, which is smaller than the first radius of  
4     curvature, wherein an edge of the second part of the insulating plate is  
5     connected to the confinement layer.

1           4.     The apparatus as claimed in claim 2, wherein the insulating  
2     plate has a dome shape having a predetermined radius of curvature, and the  
3     second length is the same as the projected diameter of the insulating plate.

1           5.     The apparatus as claimed in claim 2, wherein the insulating  
2     plate is a circular plate having a predetermined diameter, and the second  
3     length is the diameter of the insulating plate.

1           6.     The apparatus as claimed in claim 1, wherein the plasma  
2     concentrating means comprises:  
3                 an electrode having a first length;  
4                 an insulating plate having a dome shape, positioned to face the  
5     electrode and including a first part having a first radius of curvature and a  
6     second part having a second radius of curvature which is smaller than the  
7     first radius of curvature; and

8                   a confinement layer connected to the second part of the insulating  
9                   plate and extending toward the electrode,  
10                   wherein a second length, which is a projected length of the insulating  
11                   plate, is larger than the first length of the electrode.

1                   7.       The apparatus as claimed in claim 6, wherein the confinement  
2                   layer is substantially perpendicular to the projected length of the insulating  
3                   plate.

1                   8.       The apparatus as claimed in claim 2, further comprising a  
2                   chuck for supporting a wafer having a third length and disposed on the  
3                   electrode.

1                   9.       The apparatus as claimed in claim 8, wherein the second  
2                   length is over 140% of the third length.

1                   10.      The apparatus as claimed in claim 9, wherein the first length of  
2                   the electrode is over 120% of the third length.

1                   11.      The apparatus as claimed in claim 10, wherein the distance  
2                   from the edge of the wafer to an associated edge of the electrode is between  
3                   10 and 15% of the third length.

1           12. The apparatus as claimed in claim 10, wherein the second  
2           length is approximately 420mm and the third length is approximately  
3           300mm.

1           13. The apparatus as claimed in claim 12, wherein the electrode  
2           has a diameter of approximately 360mm.

1           14. The apparatus as claimed in claim 2, wherein the acute angle  
2           is between 45 and 89 degrees.

1           15. The apparatus as claimed in claim 2, wherein the confinement  
2           layer is formed of a sidewall of the chamber.

1           16. The apparatus as claimed in claim 1, wherein the plasma  
2           generating means is installed outside of the chamber to generate plasma  
3           that is introduced into the plasma generating region of the chamber.

1           17. The apparatus as claimed in claim 16, wherein the plasma  
2           generating means comprises a plurality of induction coils mounted on the  
3           chamber and a first power supply connected to the plurality of induction coils.

1           18. The apparatus as claimed in claim 17, wherein the plasma  
2 generating means comprises a second power supply connected to an  
3 electrode on which the semiconductor device is positioned.

1           19. An apparatus for increasing plasma density at an edge of a  
2 semiconductor device during a plasma-etch manufacturing process,  
3 comprising:

4           a first chamber within which a plasma is generated, and  
5           a second chamber within which the semiconductor device is  
6 positioned for plasma-etch manufacturing process,  
7           the second chamber having a smaller cross-sectional area than the  
8 first chamber.

1           20. The apparatus as claimed in claim 19, further comprising a  
2 plurality of induction coils for generating the plasma in the first chamber, and  
3 an electrode for attracting the plasma into the second chamber.